

**A STUDY OF ESOPHAGEAL MOTILITY CHANGES  
FOLLOWING ENDOSCOPIC VARICEAL BAND  
LIGATION OR SCLEROTHERAPY USING HIGH  
RESOLUTION MANOMETRY**

*Dissertation submitted to*

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**DM (MEDICAL GASTROENTEROLOGY)**

**BRANCH – IV**



**THE TAMILNADU  
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## DECLARATION

I solemnly declare that this dissertation titled **“A STUDY OF ESOPHAGEAL MOTILITY CHANGES FOLLOWING ENDOSCOPIC VARICEAL BAND LIGATION OR SCEROTHERAPY USING HIGH RESOLUTION MANOMETRY”** is done by me in the Department of Medical Gastroenterology, Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai under the guidance and supervision of professor & Head of the Department, Department of Medical Gastroenterology, Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai. This dissertation is submitted to the Tamil Nadu Dr.MGR Medical University, Chennai in partial fulfillment of the university requirements for the award of the degree of DM Medical Gastroenterology.

Place : Chennai

Date :

Dr. M. Malarvizhi  
Postgraduate student,  
Dept of Medical Gastroenterology,  
Madras Medical College,  
Chennai.

## **CERTIFICATE**

This is to certify that the Dissertation entitled, “**A STUDY OF ESOPHAGEAL MOTILITY CHANGES FOLLOWING ENDOSCOPIC VARICEAL BAND LIGATION OR SCLEROTHERAPY USING HIGH RESOLUTION MANOMETRY**” is the bonafide record work done by **Dr.M.MALARVIZHI**, under our guidance and supervision in the Department of Medical Gastroenterology, Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai submitted as partial fulfillment for the requirements of D.M. Degree examination Branch IV MEDICAL GASTROENTEROLOGY, AUGUST 2012, under The .Dr M.G.R. Medical University, Chennai.

**Dr.V.Kanagasabai, M.D.,**  
The Dean,  
Madras Medical College,  
Chennai.

**Dr. Mohammed Ali, M.D., D.M.,**  
Professor and Head,  
Dept of Medical Gastroenterology,  
Madras Medical College,  
Chennai.

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## **INTRODUCTION**

Portal Hypertension causes Gastrointestinal Bleeding .It is most frequently due to Gastro Esophageal varices (65-70%) and isolated Gastric varices (10-15%).

### **Endoscopic therapy<sup>(1)</sup>**

Endoscopic therapy is the only treatment modality that is widely accepted for the prevention of variceal bleeding, control of acute variceal bleeding, and prevention of variceal rebleeding. Endoscopic Variceal therapy includes Variceal Sclerotherapy and Variceal Band Ligation.

### **SCLEROTHERAPY**

The technique involves injection of a sclerosant into (intravariceal) or adjacent to (paravariceal) a varix. Some paravariceal injection usually takes place during attempted intravariceal therapy. The sclerosants used include sodium tetradecyl sulfate, sodium morrhuate, ethanolamine oleate, and absolute alcohol.

### **COMPLICATIONS OF ENDOSCOPIC VARICEAL THERAPY**

#### **During Procedure**

Aspiration pneumonia

Retrosternal chest pain

**Following Procedure**

Bleeding

Esophageal dysmotility

Esophageal stricture

Local ulcers

Mediastinitis

Perforation

**Systemic (Usually with Sclerotherapy)**

Mesenteric venous thrombosis

Pulmonary embolism

Sepsis

**Variceal Band Ligation**

Endoscopic variceal ligation is the preferred endoscopic modality for control of acute Esophageal variceal bleeding and prevention of rebleeding, however, the utility of band ligation in the treatment of gastric varices is limited. Variceal ligation is simpler to perform than injection Sclerotherapy. The procedure involves suctioning of the varix into the channel of an endoscope and deploying a band around the varix. The band strangulates the varix, thereby causing thrombosis. Multi-band



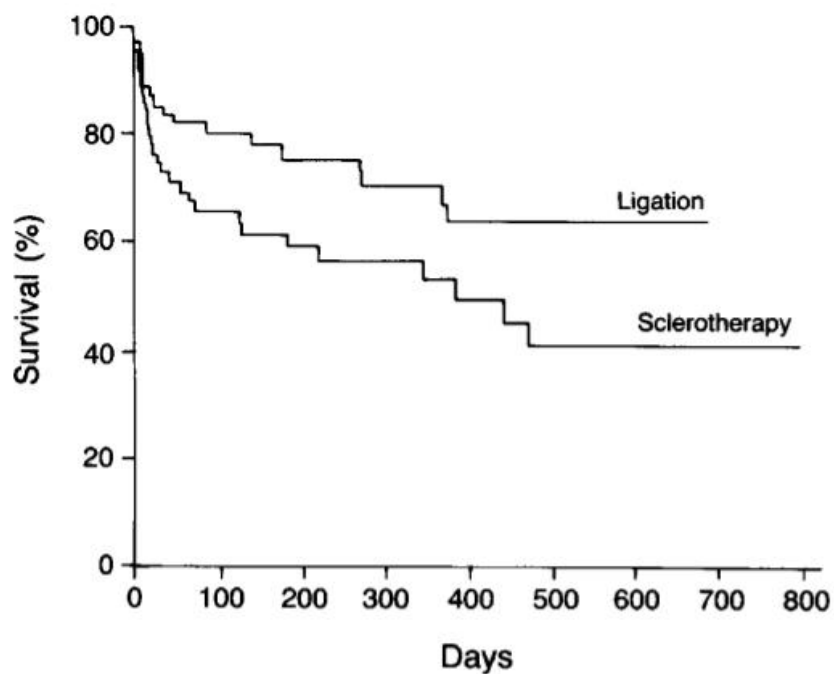
devices can be used to apply several bands without requiring withdrawal and reinsertion of the endoscope. Varices at the Gastroesophageal junction are banded initially, and then more proximal varices are banded in a spiral manner at intervals of approximately 2 cm the endoscope is then withdrawn. Varices in the mid-or proximal Esophagus do not need to be banded. Endoscopic Variceal Ligation is associated with fewer complications than sclerotherapy and requires fewer sessions to achieve Variceal obliteration.

Endoscopic Variceal Ligation can cause local complications, including Esophageal ulcers strictures, and Dysmotility, albeit less frequently than does Sclerotherapy. Banding-induced ulcers can be large and potentially serious if gastric Fundal Varices are banded.

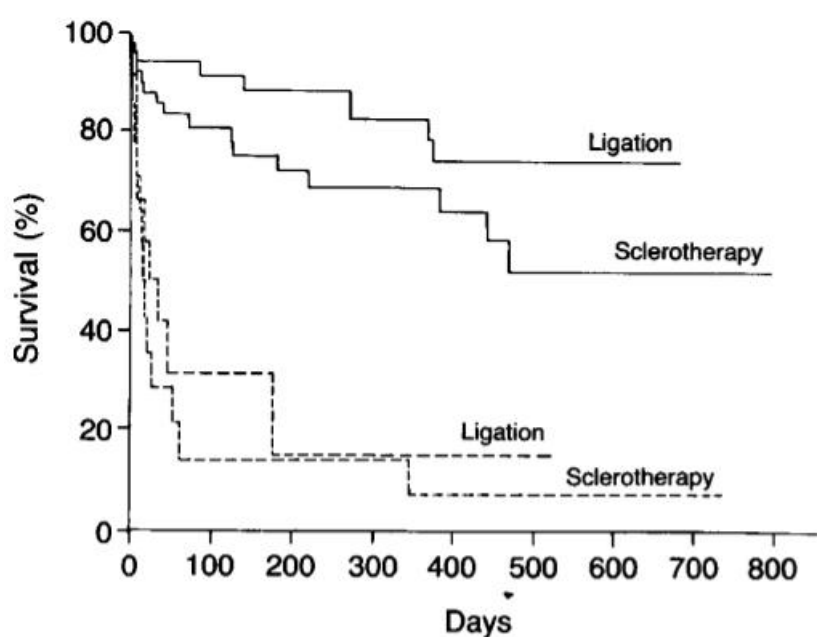
The incidence of treatment-related complications associated with Endoscopic Ligation was significantly lower than that associated with Sclerotherapy. The incidence and type of complications in the current group of patients undergoing Sclerotherapy were similar to those described in previous reports. Half the complications were Esophageal strictures without apparent long-term sequelae. <sup>(2)</sup>

The management of Variceal bleeding remains a clinical challenge with a high mortality. Despite improvement in therapy there is six week mortality of atleast 20%. Although the overall survival rate has improved in recent years mortality is still closely related to failure to control the

initial bleeding or early rebleeding, which occurs in up to 30-40% of patients within the first 5 days after the initial bleeding episode<sup>(3)</sup>



Survival in Patients with Cirrhosis and Bleeding Esophageal Varices Treated with Endoscopic Sclerotherapy or Endoscopic Ligation.



## Survival in Patients with Cirrhosis and Bleeding Esophageal Varices Treated with Endoscopic Sclerotherapy or endoscopic Ligation According to Severity of Liver Disease (Child-Pugh Class)

Endoscopy therapy is widely used for treatment of Variceal bleeding.

Endoscopy Variceal Banding and Sclerotherapy are the first line therapies for bleeding Variceal bleeding.

Endoscopic Sclerotherapy has been proved effective in control of acute bleeding and decreases the 42 day mortality and is also effective in preventing Variceal re bleeding .<sup>(4)</sup>

The complication rates are less in EVL when compared with Endoscopic Variceal Sclerotherapy.<sup>(5)</sup>

Dysmotility of the Esophagus can occur following both Endoscopic Variceal Band Ligation as well as Endoscopic Sclerotherapy.

Dysmotility of the Esophagus whether they are symptomatic causing dysphagia is still a speculation

Whether these motility changes are reversible or progressive to affect the motor function of the Esophagus.?

With these questions in mind a Review of literature was done.

## **ESOPHAGEAL MANOMETRY**

Manometric techniques have improved in a stepwise fashion from a single pressure channel to the development of high resolution manometry(HRM) with upto 36 pressure sensors.

### **Evolution of Manometry techniques**

1883 Kronecher and Meltzer used air-filled balloons connected to a manometer,<sup>(6)</sup>

1940 by Ingelfinger and Abbott used water filled balloons .<sup>(7)</sup>

1967 Winans and Harris introduced perfused tubes<sup>(9)</sup>

1977 Finally Arndorfer introduced capillary infusion system

Use of computer in this field has revolutionized the diagnostic accuracy and reproducibility of the results.

It has also made the procedure user friendly especially in terms of calculating results

Advancement in the computer processing allow pressure data to be presented in real time as a compact ,visually intuitive spatiotemporal plot of Esophageal pressure activity.

Spatio-temporal plots provide objective measurements of the forces that move food and fluid from the pharynx to the stomach and determine the risk of reflux events.

### **High resolution manometry**

The foundations of HRM were laid in the early 1990 s by Clouse and Staiano.<sup>(10)</sup>

Pressure activity is assessed for several swallows at closely spaced positions through the Esophagus.

Time, catheter position and average pressure are then reconstructed into pseudo-3D "topographic plots" that demonstrated the functional anatomy of the Esophagus<sup>(11)</sup>

High resolution manometers use micro manometers water perfused assemblies with 21-32 channels.<sup>(13, 14)</sup>

More recently solid state catheters with up to 36 pressure sensors have been devised.

HRM reveals the dynamic action of the upper Esophageal sphincter the segmental character of Esophageal peristalsis and the functional anatomy of the Esophago-gastric junction.

Spatiotemporal plots constructed from data acquired by closely spaced pressure sensors (<2cms) provide an accurate representation of the relationship between closure force (contractile pressure), clearance force (intrabolus pressure )and outflow resistance (nadir pressure and pressure gradient across the Esophagogastric junction.<sup>(15, 16, 17)</sup>

The pattern of Esophageal peristalsis and sphincter activity defines whether Esophageal motor activity is normal or abnormal.

The intra bolus pressure and Esophago-gastric pressure gradient define whether or not this activity is consistent with effective function.

Spatiotemporal plots of pressure information make it easy to identify normal and abnormal patterns of Esophageal motility<sup>(44)</sup>.

The advantage of HRM is identification of focal dysmotility limited to a short segment of Esophagus which might have been missed by Conventional Manometry.<sup>43</sup>

### **Description of the Equipment:**

#### **Equipment:**

Solid catheter probe system

Water perfusion manometric system

**Water perfusion Manometric systems include**

Water perfused catheter

Hydraulic infusion pump

External transducer

Computer with dataware for analysis.

**Water perfused polyvinylchloride catheter**

The diameter of the catheter is 4 mm, containing 16 capillary lumens within the catheter of approximately 0.8 mm in diameter and has side openings 0.8 mm in diameter around a central lumen.

Each of the eight capillary tubes has an opening at a set point along its length.

These are used for assessment of pressures in the body of the oesophagus.

The other end of the catheter consists of 16 individual capillary tubes.

Each capillary tube is marked for identification and ending with a special tip for connection to the external transducers, set on a rack at the same level as the subject's oesophagus in the supine position and are connected to both the hydraulic infusion pump and polygraph.<sup>(18)</sup>



**Fig.1**



**Fig.2**

### **Hydraulic infusion pump**

The infusion pump perfuses the catheter at a constant rate and pressure.

When the individual catheter orifices are occluded (either by a contracting.

LOS or a wave in the oesophageal body), the pressure in the water filled tube rises and this is recorded by the external transducers.<sup>(19)</sup>



## External transducer

This pressure information is converted to an electrical signal by the transducer and displayed on a dedicated computer monitor Computer with software : to analyse data.



**Fig.3**



**Fig.4**

## **AIM OF THE STUDY**

To study the Esophageal Motility changes following Endoscopic Variceal Band Ligation or Sclerotherapy using High resolution Manometry.

## REVIEW OF LITERATURE

### **Early changes in Esophageal motility Nitin M Narwanwe et al<sup>(20)</sup>**

This study was done using water perfusion manometry in patients with portal hypertension without ascites 24 hrs following two sessions of Endoscopic variceal Band ligation/Endoscopic sclerotherapy

Manometry was done to measure the LES pressure, amplitude of contraction in 10cms and 5cms of lower Esophagus .

**Dysmotility** was defined as presence of any one of the following .

High amplitude contractions in the lower segment of the Esophagus, simultaneous peristaltic contractions, hypotensive <20mmhg contractions.

### **Conclusion:**

There were dysmotility changes following EST/EVL 24 hrs after endotherapy and it was pronounced after the second session.

These dysmotility changes did not produce any symptoms in the patients.

### **What we derive from this study ?**

Early changes following Endoscopic sclerotherapy and Endoscopic Variceal Band Ligation can be due to **Esophageal inflammation** which

is more profound after 24hrs and inflammation can be more after 2 sessions.<sup>(35)</sup>

**Sequential esophageal motility studies after endoscopic injection sclerotherapy: a prospective investigation.**<sup>(21)</sup>

**Grande L, Planas R, Lacima G, Boix J, Ros E, Esteve M, Morillas R, Gasulle et al...**

This study was done in 13 cirrhotic patients using water perfusion manometry 24hrs following endoscopic variceal sclerosis and 4 weeks following the endoscopic variceal sclerosis.

The observation of the study was the amplitude of contractions were reduced in the lower segment of the Esophagus and simultaneous persaltic contractions were observed 24hrs after the procedure but these changes disappeared 4weeks later.

Conclusion of the study was

Dysmotility changes do occur after Endoscopic Variceal Sclerosis but these changes do not interfere with motor transport of the esophagus.

Dysmotility changes are reversible.

After review of these two articles the questions are

Dysmotility of the esophagus following EST /EVL are due

1. Esophageal inflammation following injection of Sclerosants and or Variceal Band Ligation?
2. Are these changes reversible if it is due to inflammation?
3. The changes are reversible which suggests strongly that inflammation has reduced after 4 weeks or there is early remodelling of Esophageal injury that has lead to the reversibility of the Dysmotility changes.

### **Can Dysmotility be a late complication ?**

If so does it show Histological changes causing Fibrosis ?

Further search of Literature Review was done to look for late complications following EST /EVL<sup>(26)</sup>

### **Histologic and Manometric Studies on the Esophagus Following Endoscopic Sclerotherapy.**

**[My paper]Peeyush Sharma, Inga Hagerstrand, Dave Sharma**

This study was done in patients who underwent endoscopic sclerotherapy and or surgery for portal hypertension. The study was done 2-12 yrs after EST/surgery,

The histologic findings were done by taking biopsy in the lower esophagus. It showed chronic inflammatory changes

The authors concluded that dysmotility occurring as a late complication due chronic persistent inflammatory changes due to Endoscopic Variceal Sclerotherapy.

**Long-term effects of repeated injection sclerotherapy on esophageal motility and mucosa.** <sup>(24)</sup>

**[My paper]B Isaksson, F Johnsson, B Jeppsson**

Department of Surgery, Lund University Hospital, S-221 85 Lund, Sweden.

**Long-Term pH and Manometric Evaluation of the Distal Esophagus After Endoscopic Sclerotherapy of Esophageal Varices**

Mario Costantini<sup>1</sup>, Giovanni Zaninotto<sup>1</sup>

Neurogastroenterology & Motility<sup>(22)</sup>

This study was done in 21 patients to assess manometric changes following endoscopic sclerotherapy. The authors concluded that endoscopic sclerotherapy had significant structural changes but did not cause significant gastroesophageal reflux.

## **Esophageal motility changes after endoscopic intravariceal sclerotherapy with absolute alcohol.**

**U C Ghoshal et al<sup>(23)</sup>**

This study was conducted in 24 patients after endoscopic sclerotherapy using Absolute alcohol.

This study shows frequent occurrence of esophageal dysmotility after EST with AA; however, esophageal dysmotility after EST was infrequently associated with motor dysphagia

Are there any other confounding factors which would contribute to these motility changes.

The two main confounding factors are Alcohol and presence of Ascites in these patients

## **High amplitude contractions in the middle third of the oesophagus: a manometric marker of chronic alcoholism?<sup>(25)</sup>**

23 Chronic alcoholic patients underwent manometry . They were compared with Age matched controls

### **Conclusion of the above study:**

Oesophageal peristaltic dysfunction and reflux are frequent in alcoholism.

High amplitude contractions in the middle third of the oesophagus seem to be a marker of excessive alcohol consumption, and tend to improve with abstinence.

**Lower Esophageal Sphincter Pressure in Cirrhotic Men with Ascites: before and after diuresis.<sup>(27)</sup>**

Lower Esophageal sphincter pressure (LESP) was measured in 10 biopsy-proved cirrhotics with esophageal varices and tense ascites before and after diuresis to evaluate of ascites might play in the development of variceal bleeding.

This study show motility changes in mid esophagus and LES relaxation pressure.

Conclusion: Elevated intraabdominal pressure due to ascites caused significant motility changes and LES pressure changes.

**After analysis of these literature review**

It is well documented that Endoscopic therapy both Endoscopic Variceal Band Ligation and Endoscopic Variceal Sclerotherapy affects the Esophageal motility.

These changes could be Early due to inflammation of the Esophagus which is reversible



Long term effects causing Motility changes are due fibrosis though does not produce any symptoms like dysphagia

There are confounding factors like changes produce by effect of Alcohol per se.

Ascites causing elevated intraabdominal pressure do cause motility changes of Esophagus?

What are the parameters of manometric findings which are affected due Endoscopic Sclerotherapy?

**Does these motility changes cause symptoms like Dysphagia?**

This study was designed to evaluate changes in motility of the Esophagus using High Resolution Manometry in patient who have undergone Endoscopic Variceal Band Ligation and Endoscopic Sclerotherapy

This study was designed to be a prospective study done six month after the Endoscopic procedures.

## **MATERIAL AND METHODS**

**Study Design** : Prospective study

**Total no.of subjects** : 20

Patients who were diagnosed to have portal hypertension who were referred to the department of Gastroenterology at Madras Medical College Hospital were included in this study

The diagnosis of portal hypertension and its etiology was established by Clinical Biochemical Imaging and Histology if needed

An informed consent was obtained from these patients,

A baseline Esophageal Manometry is done for these patients using High Resolution Manometry

Depending on the clinical situations these patients were subjected to Endoscopic Variceal Sclerotherapy and or Variceal Band Ligation.

### **Endotherapy:**

Endoscopic Variceal Sclerotherapy was done using Sclerotherapy Needle (Indoinvasive Needle) using AOHUA Endoscopic Control System Model VME2000 serial no 5208880

The agent used was Injection polidoconal 3% diluted to 1.5%.

Both intra variceal as well as paravariceal injection were given

Ooze was controlled with scope tamponade

### **Endoscopic variceal Band Ligation:**

Endoscopic Variceal Band ligation was done using multiband Ligator (Variclear Multiband Ligator 6 preloaded Bands ,catheter and irrigation adaptor.

Details such as amount of sclerosant injected, Number of sessions, Number of Bands applied complications if any were collected

The patients were asked to come after six months . Their symptoms were reviewed.

Esophageal Manometry was repeated after six month using High Resolution Manometry.

**High Resolution Manometry:****Equipment:****Water perfusion manometric system**

*Geoff Hubbard systems, Royal Melbourne, Australia*

16 lumen catheter

*Dataware Trace 1.2 V software (Geoff Hubbard systems, Royal Melbourne, Australia)*

**High Resolution Manometry Procedure:**

1. Subjects were instructed to come after an over night fast to reduce the risk of aspiration during intubation.
2. History about any medication taken 48 hours prior to the test, to exclude medication (prokinetic drugs, nitrates, anticholinergics, Calcium channel blocker or sedatives) which will influence the oesophageal motility.
3. Dentures (if any) were asked to be removed
4. The catheter lumens were prefilled with sterile water and the lumens were capped to retain the fluid, which also helped to prevent saliva and food debris from filling the lumens.

5. Intubation was in supine position Trans nasal without topical anesthesia
6. The catheter was inserted sufficiently, so that there were no pressure measuring ports covering at least 10 cm of the stomach i.e when the 50 cm mark on the tube was at the tip of the nose.
7. Catheter is positioned and the subject is asked to lie down relaxedly
8. The catheter was connected to the transducers and infusion commenced.
9. A period of at least 10 minutes were allowed for stabilization of the subject's state and the recording system.
10. The infusion pump was turned on with a transfusion rate of 0.6 ml / minute.
11. The subject's name, age, sex, hospital number and the date were entered in the computer
12. Baseline LES was noted following 5 minutes of wet swallow within an interval of 30 seconds between each swallow.

Each 10 wet swallow phase includes Upper Esophageal Relaxation, Body contour and LES relaxation.

Esophageal Body contour was clearly visualised by isobaric color contour plot which provides continuous depiction of pressure of entire esophagus.

This allows complete spatio temporal analysis of esophageal motion events.

Pressure in the esophagus is converted to an electrical signal by the pressure transducer.

This signal is amplified and filtered then digitized using standard circuit to the computer

Software will display, analyse data as a spatiotemporal plot against both time and distance along the Esophagus.

## OBSERVATIONS & RESULTS

Total of Twenty patients were included in this study.

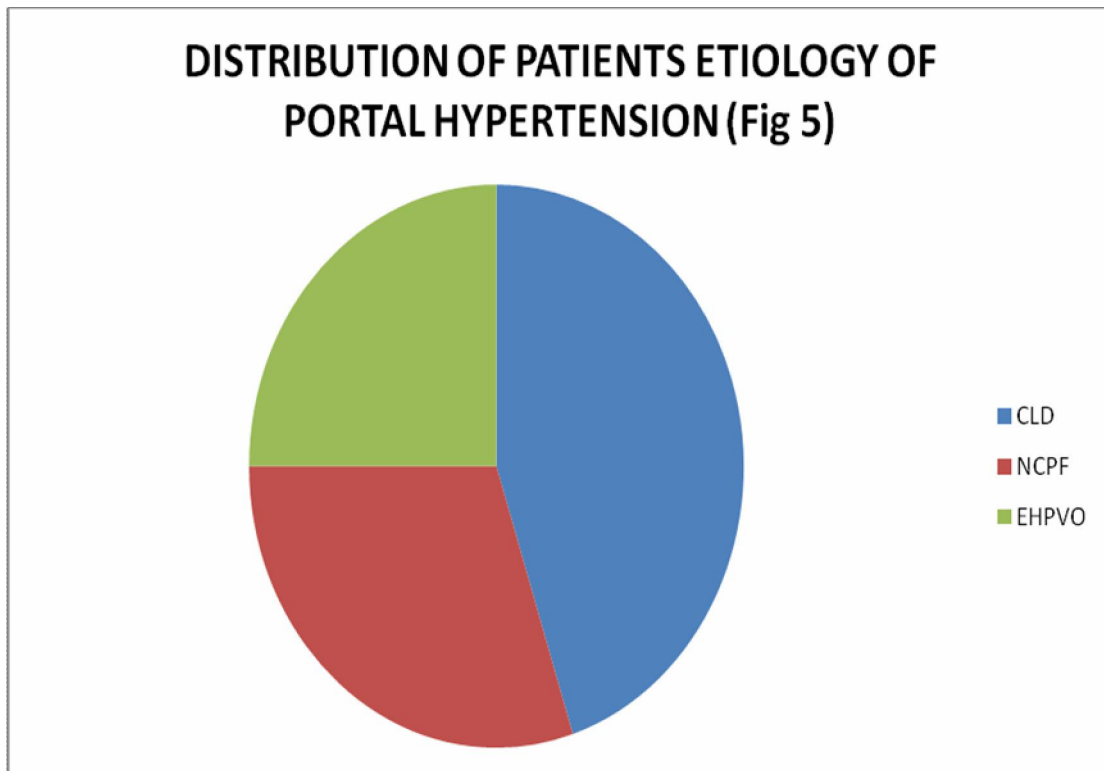
The age group of the patients were between 17-56 median of 36.6 yrs

No. of females : 16

No. of males : 4

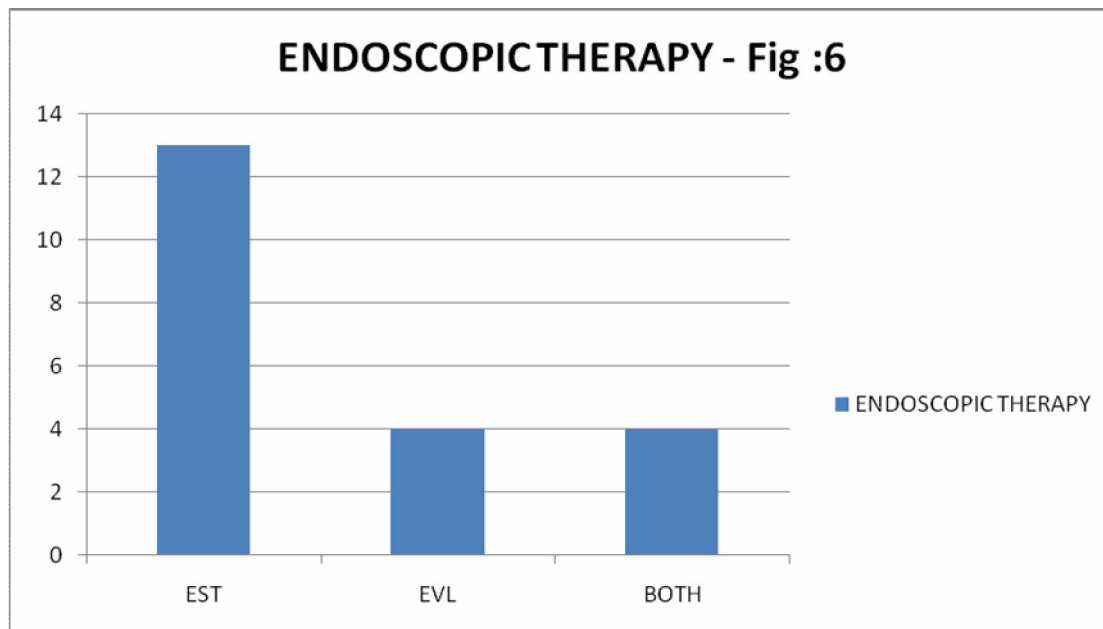
**TABLE - 1**

<b>MULTI VARIATE ANALYSIS OF DATA (Table:1)</b>	
<b>VARIABLES</b>	<b>No. of patients</b>
Age	17-56 (36.5)
Sex	
MALE	4
FEMALE	16
Etiology of Portal Hypertension	
CLD	9
EHPVO	6
NCPF	5
Endoscopic therapy	
EST	12
EVL	4
BOTH	4



**FIG 5. SHOWS THE DISTRIBUTION PATTERN OF DISEASES  
CAUSING PORTAL HYPERTENSION.  
MAJORITY WAS CHRONIC LIVER DISEASE, FOLLOWED BY  
NCPF AND EHPVO**





**Fig 6:**

**Mode of Endoscopy Therapy EST:13 EVL:4 Both :4.**

**Majority of the Patients were subjected to Endoscopic Sclerotherapy.**

**Four patients underwent EVL & Some Patients under went both EVL & EST**

## High Resolution Manometry

### BASELINE MANOMETRIC FINDINGS:

The Manometry was done for all patients before they were subjected to Endotherapy, the findings are recorded in terms of Changes in Amplitude (mm/hg) Length in mm & Velocity (mms/sec).

### UPPER ESOPHAGUS (Table:2)

**TABLE : 2**

<b>Variables</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>P-Value</b>
Length BL UE	20	58.05	5.66	0.239
Length 6M UE	20	60.02	8.39	
Amplitude BL UE	20	49.55	7.33	0.053
Amplitude 6M UE	20	52.73	10.32	
Velocity BL UE	20	34.50	9.03	0.564
Velocity 6M UE	20	33.73	9.21	

These are the Manometric finding before & after Endotherapy in the Upper Esophagus.

There are no significant changes in the upper Esophagus following Endotherapy.

# **MANOMETRIC CHANGES AFTER DIFFERENT MODES OF ENDOTHERAPY:**

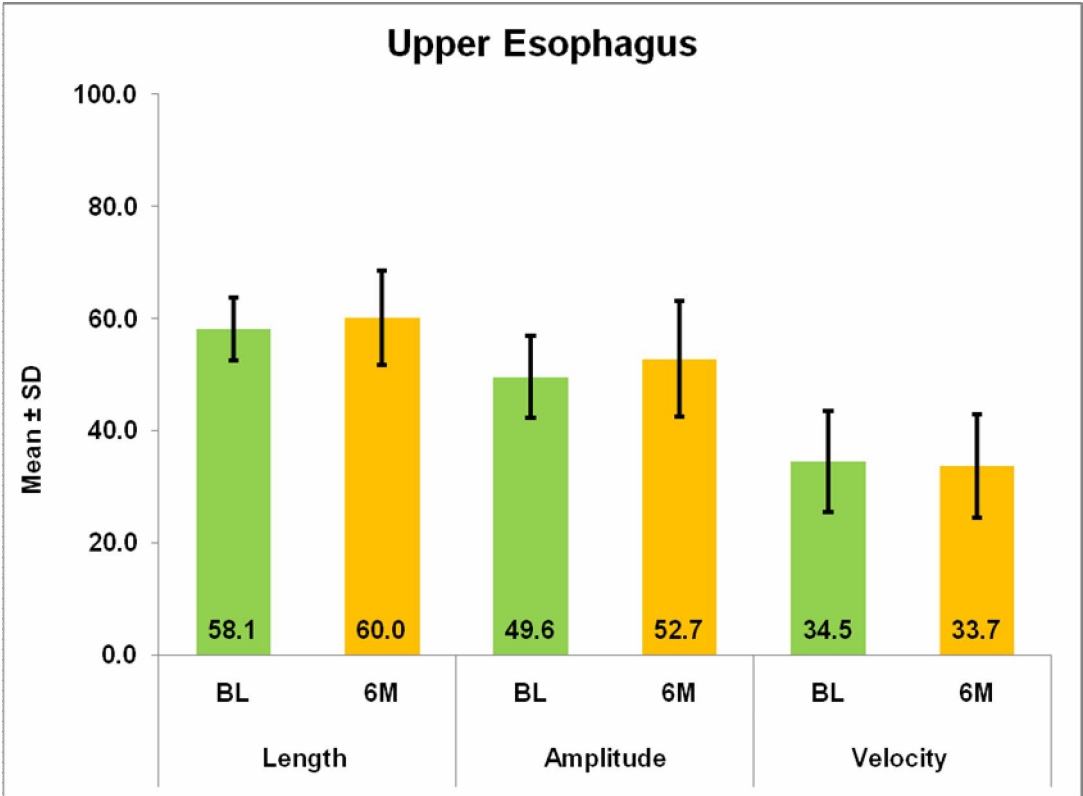
## **Upper Esophagus (Table:3)**

**TABLE: 3**

<b>Therapy</b>		<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>P-Value</b>
<b>EST</b>	Length BL UE	13	56.80	5.19	0.965
	Length 6M UE	13	56.90	7.89	
	Amplitude BL UE	13	50.50	7.03	0.097
	Amplitude 6M UE	13	54.56	11.02	
	Velocity BL UE	13	36.04	10.22	0.214
	Velocity 6M UE	13	33.85	10.13	
<b>EVL</b>	Length BL UE	3	58.42	6.82	0.056
	Length 6M UE	3	64.34	4.62	
	Amplitude BL UE	3	50.64	11.61	0.790
	Amplitude 6M UE	3	50.99	11.56	
	Velocity BL UE	3	36.51	4.84	0.941
	Velocity 6M UE	3	36.20	9.64	
<b>Both</b>	Length BL UE	4	61.82	6.20	0.053
	Length 6M UE	4	66.92	7.65	
	Amplitude BL UE	4	45.67	5.25	0.349
	Amplitude 6M UE	4	48.07	7.29	
	Velocity BL UE	4	27.99	3.52	0.160
	Velocity 6M UE	4	31.47	7.18	

There is no Significant changes in the Amplitude (mm/hg), Length in mm & Velocity (cms/sec) of the Upper Esophagus following Endotherapy in comparison to different modes of endotherapy(Refer chart 1).

CHART : 1



## MANOMETRIC FINDINGS OF MIDDLE ESOPHAGUS

**Baseline & after 6months:**

**MIDDLE ESOPHAGUS (Table:4)**

**TABLE : 4**

<b>Variables</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>P-Value</b>
Length BL ME	20	66.72	9.00	0.070
Length 6M ME	20	64.07	8.53	
Amplitude BL ME	20	54.81	18.48	0.302
Amplitude 6M ME	20	69.94	5.92	
Velocity BL ME	20	32.09	5.60	0.170
Velocity 6M ME	20	33.75	7.97	

Table 4 follows Baseline Manometric findings of Middle Esophagus in terms of Length (mm), Amplitude(mm/hg) & Velocity (mms/sec).

There was no significant changes 6 months after Endotherapy

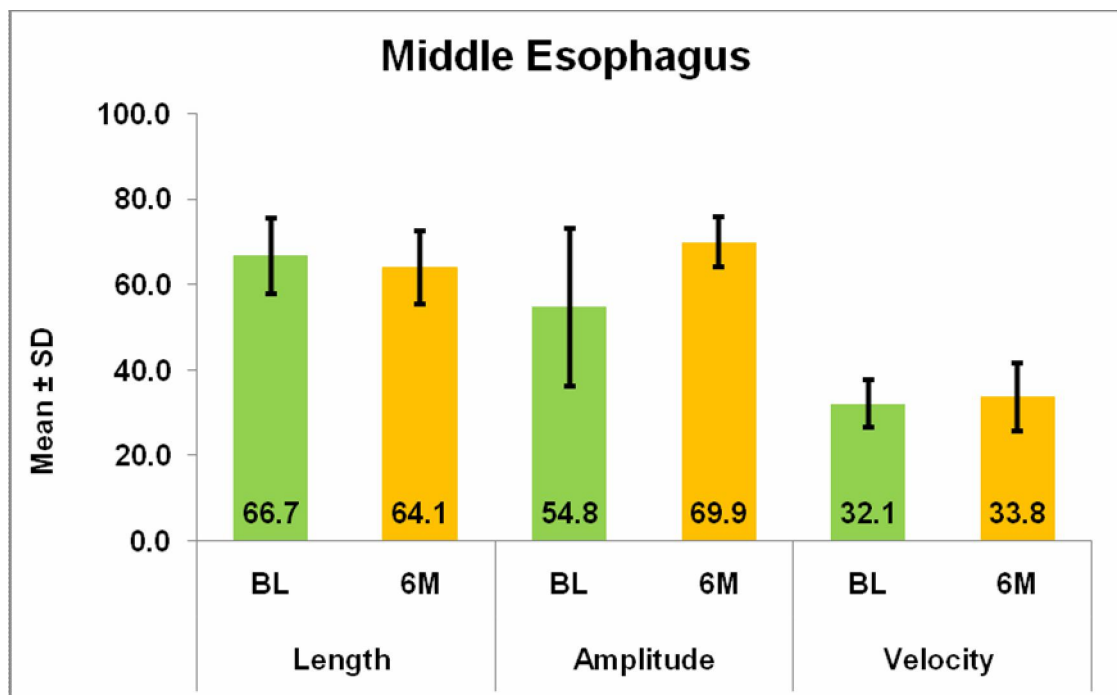
### Manometric changes after different modes of endotherapy – Middle Esophagus

**TABLE: 5**

	Therapy	N	Mean	Std. Dev	P-Value
EST	Length BL ME	13	65.40	9.88	0.282
	Length 6M ME	13	63.26	8.70	
	Amplitude BL ME	13	53.89	15.96	0.426
	Amplitude 6M ME	13	71.85	73.70	
	Velocity BL ME	13	32.89	5.43	0.029
	Velocity 6M ME	13	35.77	6.61	
EVL	Length BL ME	3	68.41	8.76	0.279
	Length 6M ME	3	63.63	13.90	
	Amplitude BL ME	3	54.14	29.56	0.481
	Amplitude 6M ME	3	71.27	8.71	
	Velocity BL ME	3	29.99	5.81	0.129
	Velocity 6M ME	3	23.56	1.38	
Both	Length BL ME	4	69.74	6.98	0.376
	Length 6M ME	4	67.02	3.75	
	Amplitude BL ME	4	58.28	23.25	0.410
	Amplitude 6M ME	4	62.75	17.71	
	Velocity BL ME	4	31.10	7.05	0.097
	Velocity 6M ME	4	34.86	10.13	

There is no Significant changes in the Amplitude (mm/hg), Length (mm) of the Middle Esophagus following Endotherapy.(Chart 2)

There is a significant change an increase in velocity following Endoscopic sclerotherapy six months after the procedure.

**CHART : 2**

## MANOMETRIC FINDINGS OF LOWER ESOPHAGUS:

### Baseline & after 6 months

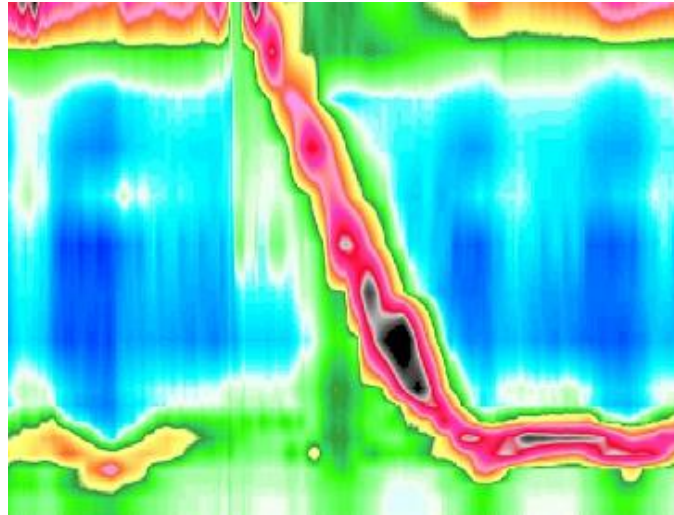
**TABLE : 6**

<b>Variables</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>P-Value</b>
Length BL LE	20	52.60	7.85	0.098
Length 6M LE	20	47.27	11.42	
Amplitude BL LE	20	77.82	15.79	<b>≤0.001</b>
Amplitude 6M LE	20	55.15	21.74	
Velocity BL LE	20	28.95	5.39	<b>0.010</b>
Velocity 6M LE	20	24.09	4.86	

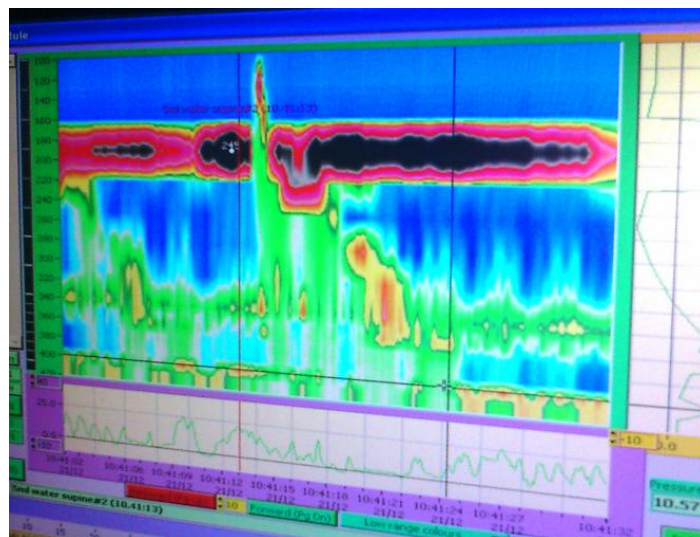
Table 6 follows Baseline Manometric findings of Lower Esophagus in terms of Length (mm), Amplitude(mm/hg) & Velocity (mms/sec)

There is a significant changes in the amplitude and velocity of contraction 6 months after Endoscopic Sclerotherapy (p value <0,001)





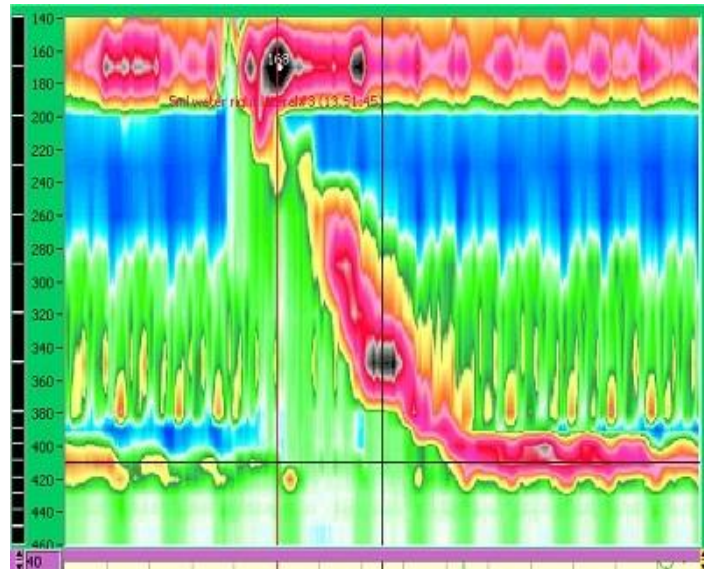
**Fig.7a**



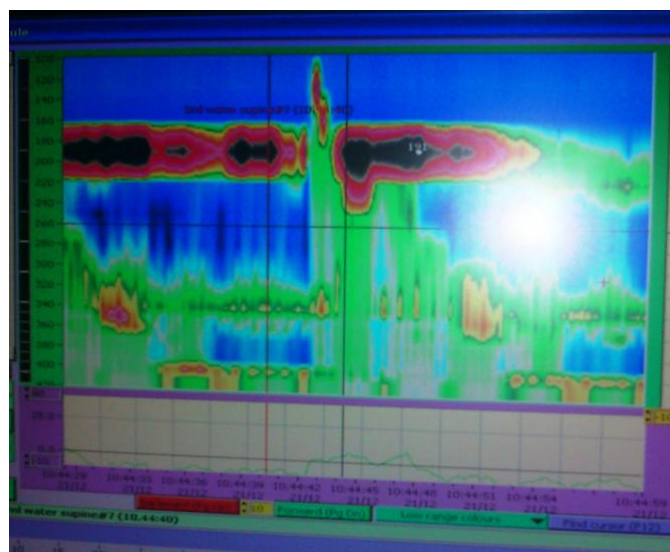
**Fig.7b**

Fig. 7a shows the tracings before the procedure – Baseline

Fig.7b shows the post procedure tracings which shows reduction in amplitude of contractions in the lower esophagus.



**Fig. 8a**



**Fig. 8b**

Fig. 8a Shows baseline manometric finding in a patient before EST

Fig. 8b Shows decreased amplitude in a patient after EST

# **MANOMETRIC CHANGES IN LOWER ESOPHAGUS AFTER DIFFERENT MODES OF ENDOTHERAPY:**

**TABLE: 7**

Therapy		N	Mean	Std. Dev	P-Value
EST	Length BL LE	13	53.61	9.47	0.225
	Length 6M LE	13	48.10	12.25	
	Amplitude BL LE	13	76.56	17.85	<0.001
	Amplitude 6M LE	13	53.81	24.15	
	Velocity BL LE	13	28.87	4.64	0.001
	Velocity 6M LE	13	23.61	5.55	
EVL	Length BL LE	3	48.50	0.81	0.476
	Length 6M LE	3	41.48	14.71	
	Amplitude BL LE	3	74.88	5.44	0.142
	Amplitude 6M LE	3	51.77	14.57	
	Velocity BL LE	3	23.57	6.45	0.874
	Velocity 6M LE	3	24.57	5.59	
Both	Length BL LE	4	52.37	3.09	0.512
	Length 6M LE	4	48.91	6.48	
	Amplitude BL LE	4	84.13	14.72	0.051
	Amplitude 6M LE	4	62.03	20.91	
	Velocity BL LE	4	33.26	4.04	0.029
	Velocity 6M LE	4	25.30	1.50	

Table7 shows Following Endotherapy Manometric changes in Lower Esophagus:

**EST Group:**

Significant changes occurred in the Amplitude of contraction P Value  $<0.001$  & Velocity of contraction **P Value 0.001** of the Lower Esophagus following Endotherapy.

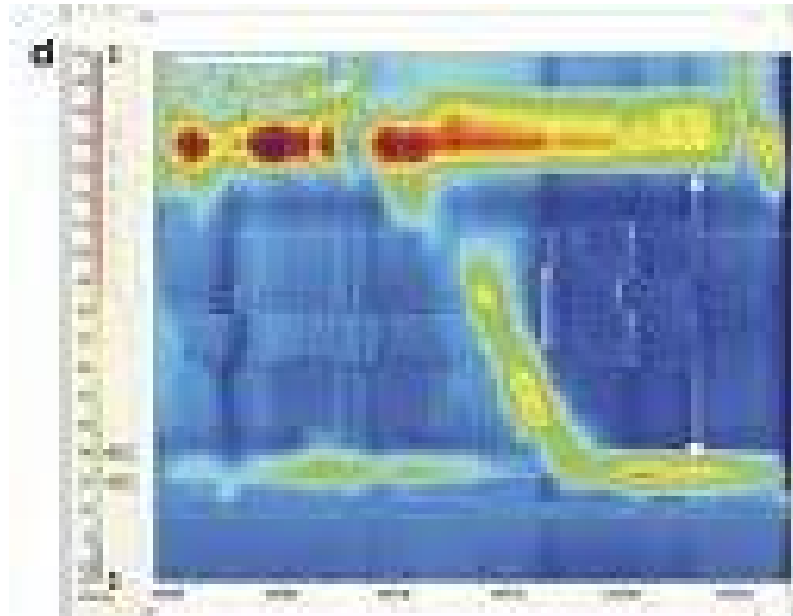
**EVL Group:**

There are no changes in Amplitude & Velocity in EVL Group.

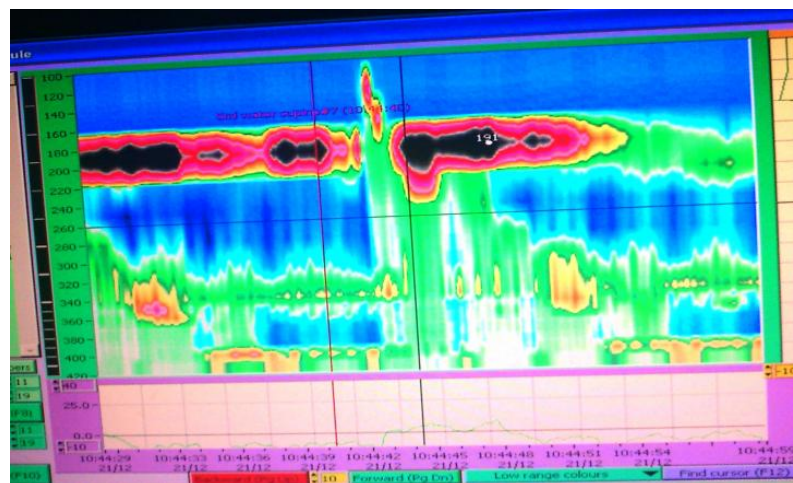
**Both EST & EVL Group:**

There was Significant change in Amplitude P Value 0.05 & Velocity P Value 0.029 in patients who underwent Both EST & EVL

However no changes were seen in the Length of the Lower Esophagus in any of the Group.



**Fig. 9a**

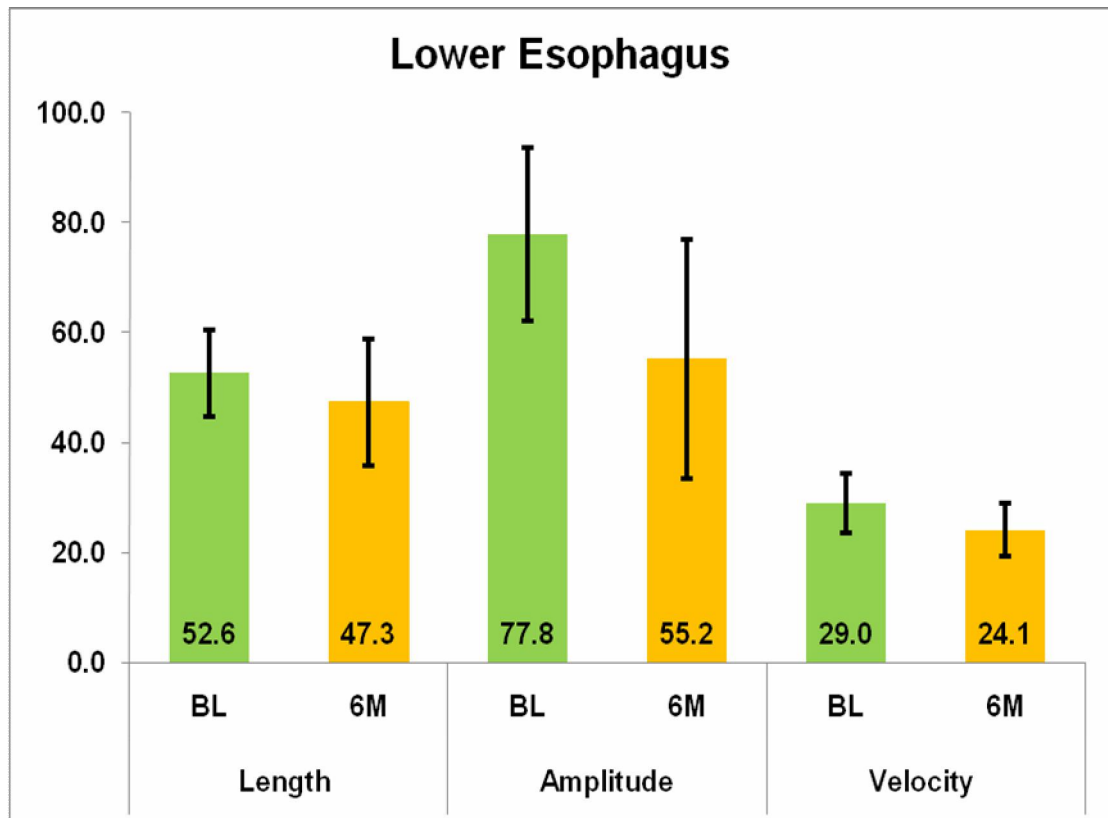


**Fig. 9b**

Fig. 9a shows baseline manometry pre procedure

Fig. 9b shows (EST & EVL group) tracings in a patient which shows decreased in the amplitude in the amplitude of contraction.

Chart : 3



**LES Pressure Baseline and after 6 Months: (Table:9)**

<b>Variables</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>P-Value</b>
LES Pressure BL	20	21.92	3.92	0.061
LES Pressure 6m	20	24.66	3.61	

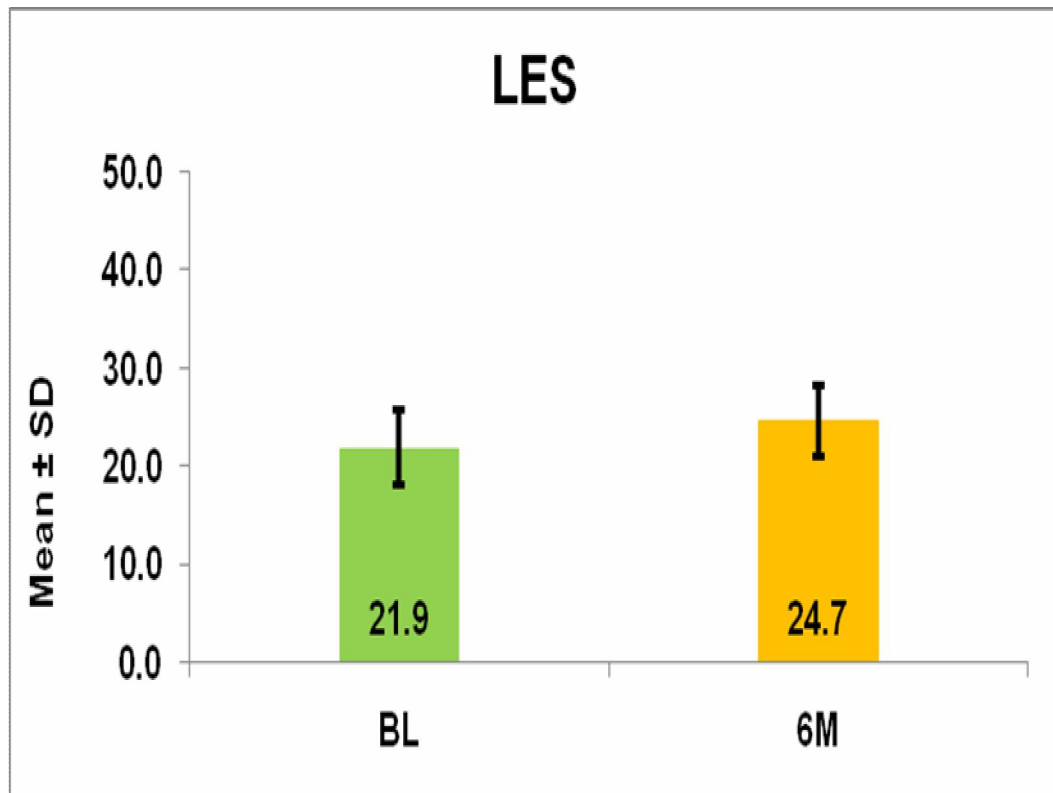
Table 9 shows There is significant changes in the LES Pressure after Endotherapy

**LES Pressure Changes Difference in Endotherapy (Table10)**

<b>Therapy</b>		<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>P-Value</b>
EST	LES Pressure BL	13	23.05	3.81	0.191
	LES Pressure 6m	13	24.76	3.40	
EVL	LES Pressure BL	3	21.48	3.82	0.191
	LES Pressure 6m	3	27.56	3.91	
Both	LES Pressure BL	4	18.58	2.95	0.067
	LES Pressure 6m	4	22.15	3.05	

Table10 shows Changes in LES Pressure in the Group were Both EST & EVL were performed.

There is no significant changes in LES pressure in Both EST and EVL group 6 months after therapy

**CHART : 4**



# **MANOMETERIC CHANGES IN THE UPPER ESOPHAGUS AFTER ENDOTHERAPY – CORRELATIONS AFTER NO.OF SESSIONS**

**TABLE : 11**

No. of Session		N	Mean	Std. Dev	P-Value
1	Length BL UE	12	57.31	6.04	0.198
	Length 6M UE	12	60.29	6.94	
	Amplitude BL UE	12	50.02	7.74	0.195
	Amplitude 6M UE	12	51.79	10.16	
	Velocity BL UE	12	37.89	10.10	0.363
	Velocity 6M UE	12	36.29	9.97	
2	Length BL UE	5	58.30	2.62	0.947
	Length 6M UE	5	58.02	10.89	
	Amplitude BL UE	5	46.62	3.82	0.301
	Amplitude 6M UE	5	53.08	13.26	
	Velocity BL UE	5	30.04	3.35	0.925
	Velocity 6M UE	5	29.68	8.13	
3	Length BL UE	3	60.56	8.81	0.561
	Length 6M UE	3	62.28	12.20	
	Amplitude BL UE	3	52.57	10.75	0.145
	Amplitude 6M UE	3	55.91	8.47	
	Velocity BL UE	3	28.40	4.19	0.199
	Velocity 6M UE	3	30.21	5.24	

There is no Significant changes in Upper Esophagus following Endotherapy correlation against no. of sessions.

# **MANOMETERIC CHANGES IN THE MIDDLE ESOPHAGUS AFTER ENDOTHERAPY – CORRELATIONS AFTER NO.OF SESSIONS**

**TABLE : 12**

	No. of Session	N	Mean	Std. Dev	P-Value
1	Length BL ME	12	66.86	10.63	0.208
	Length 6M ME	12	64.21	10.22	
	Amplitude BL ME	12	56.21	16.26	0.287
	Amplitude 6M ME	12	82.40	73.67	
	Velocity BL ME	12	31.49	5.51	0.811
	Velocity 6M ME	12	31.92	7.61	
2	Length BL ME	5	66.41	6.66	0.490
	Length 6M ME	5	63.99	4.22	
	Amplitude BL ME	5	64.05	19.81	0.596
	Amplitude 6M ME	5	59.41	17.08	
	Velocity BL ME	5	30.22	3.96	0.058
	Velocity 6M ME	5	32.02	4.15	
3	Length BL ME	3	66.67	7.66	0.065
	Length 6M ME	3	63.62	8.97	
	Amplitude BL ME	3	33.76	10.72	0.172
	Amplitude 6M ME	3	37.70	8.05	
	Velocity BL ME	3	37.65	6.50	0.025
	Velocity 6M ME	3	43.98	8.06	

There is no significant changes in Middle Esophagus against correlation against number of sessions of Endotherapy

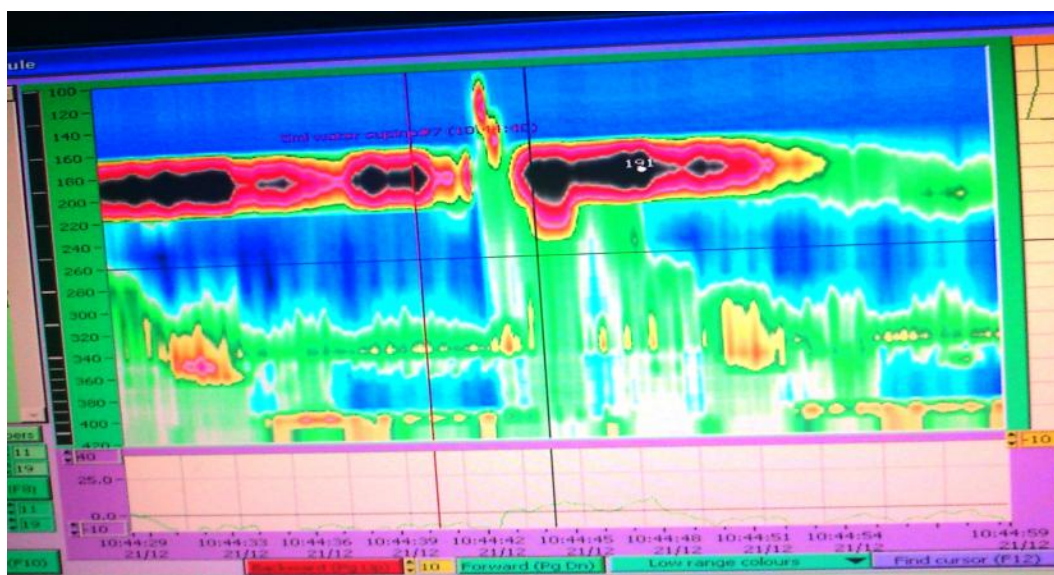
# **MANOMETERIC CHANGES IN THE LOWER ESOPHAGUS AFTER ENDOTHERAPY – CORRELATIONS AFTER NO.OF SESSIONS**

**TABLE : 13**

<b>No. of Session</b>		<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>P-Value</b>
1	Length BL LE	12	53.61	7.84	0.060
	Length 6M LE	12	44.71	11.83	
	Amplitude BL LE	12	80.19	15.14	0.001
	Amplitude 6M LE	12	56.90	22.59	
	Velocity BL LE	12	27.17	5.27	0.115
	Velocity 6M LE	12	24.08	5.23	
2	Length BL LE	5	53.15	8.18	0.812
	Length 6M LE	5	50.84	12.69	
	Amplitude BL LE	5	82.76	16.03	0.021
	Amplitude 6M LE	5	64.27	18.92	
	Velocity BL LE	5	33.42	4.31	0.010
	Velocity 6M LE	5	24.88	5.12	
3	Length BL LE	3	47.61	8.36	0.669
	Length 6M LE	3	51.53	7.08	
	Amplitude BL LE	3	60.14	5.60	0.021
	Amplitude 6M LE	3	32.94	1.48	
	Velocity BL LE	3	28.65	4.11	0.029
	Velocity 6M LE	3	22.80	4.17	

There are significant changes in Amplitude of contraction of the Lower Esophagus following Endotherapy correlation against no. of sessions. The amplitude of contraction decreases in the first session, second session and third session

There is a change in velocity following second and third session of endotherapy.



**Fig. 10**

Fig. 10 shows decreased amplitude of contraction of contraction in the lower esophagus in post EST paint after 2 sessous of endoviraty.

**LES PRESSURE CHANGES AFTER ENDOTHERAPY  
CORRELATION AGAINST NO.OF SESSION:**

**TABLE : 14**

<b>No. of Session</b>		<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>P-Value</b>
1	LES Pressure BL	12	22.95	3.91	0.065
	LES Pressure 6m	12	25.50	3.39	
2	LES Pressure BL	5	21.78	3.15	0.439
	LES Pressure 6m	5	23.58	4.10	
3	LES Pressure BL	3	18.07	3.65	0.202
	LES Pressure 6m	3	23.08	4.01	

There no significant changes in LES Pressure correlated against  
no.of sessions

## **ANALYSIS**

Paired samples T-Test to compare mean values between baseline and 6 months

Statistical analysis was done using SPSS version 1.7

P value of  $<0.05$  is statistically significant

## DISCUSSION

Endoscopic Variceal Sclerotherapy and Endoscopic Variceal Band ligation is the standard of care in the management of Variceal Bleed.

Dysmotility is a known complication of Endotherapy.

Dysmotility of Esophagus can be early or late complication.

This study was done six months after Endoscopic Sclerotherapy and or Endoscopic Variceal Band Ligation to look for any dysmotility following Endotherapy occurring as a late complication.

The patients included in this study was patients in whom the etiology of portal hypertension was Chronic liver disease of Non Alcoholic etiology, Non cirrhotic portal fibrosis and Extra hepatic portal hypertension.

This study was done using injection Polidoconal 3%-1.5% both intra variceal and Paravariceal as against the previous studies Narwane et al and UC Ghoshal et al were done using Absolute Alcohol and Phenol in water.

Two confounding variables like Alcohol and Ascites were excluded from this study.

Alcoholic Liver disease were excluded from this disease.

Alcohol per se can cause changes in Manometry causing High Amplitude contractions in the middle Esophagus and these changes disappeared after abstaining from Alcohol Grande ,et al.<sup>(26)</sup>

Ascites causes changes in the LES pressure [Van Thiel DH, Strempel JF](#)<sup>(38)</sup>

Dysmotility of the Esophagus occurs as a late complication. This could be due to fibrosis at the site of Endoscopic Variceal Sclerotherapy and Endoscopic Variceal Band Ligation causing focal segmental motility changes

Following Endoscopic intravariceal Sclerotherapy the inflammatory changes are persistent which causes dysmotility in the lower esophagus

This is supported by the study by a study by Peeyush Sharma et al

**A Study** on Histologic and Manometric Studies on the Esophagus Following Endoscopic Sclerotherapy.

[My paper]This study was done in forty six patients who have undergone Endoscopic intravariceal sclerotherapy and or Surgery.

This study was a follow up period of 2-12 yrs after the endoscopic intraviceal sclerotherapy . There was a significant change in the lower esophagus where the amplitude of contraction decreased following



intravariceal Sclerotherapy.. Mucosal biopsy was taken in duplicate from the distal esophagus which showed chornic inflammatory changes in the lower esophagus. The persistent abnormalities in the esophagus was,due to chronic inflammatory changes in the distal esophagus.

This study was done using High Resolution Manometry which uses pressure sensors placed at interval of  $< 2\text{cm}$  which will be able to detect focal segment motility changes.<sup>(49)</sup>

This is the advantage of High Resolution Manometry over Conventional Manometry<sup>(43)</sup>

The following parameters were studied using High Resolution Manometry

Amplitude of contraction(mm/hg)

Velocity of contraction(mm/sec)

Length (mms)

LES pressure(mm/hg)

Presence of any Non peristaltic waves

These changes were recorded in the Upper, Middle & Lower Esophagus.as against a study by Nitin Narwane et al<sup>(34)</sup> titled

Early changes in the motility of esophagus following Endoscopic Variceal sclerotherapy and Variceal Band Ligation changes following Endoscopic Variceal Sclerotherapy

The manometric changes were recorded in distal esophagus 5 cms and 10cms from LES.

This could be revelant in the context of transition zone of the Esophagus which occurs 8cms above the LES. The velocity of contraction reduces in this transition zone.

Narwane Et al Indian J Gastroenterology 1998.<sup>(40)</sup>

### **Manometric parameters:**

A Baseline Manometry was done for all patients. Patient with abnormal Baseline parameters were excluded from this study.

In this study there were no significant changes in Amplitude ,velocity of contraction, and length in the upper& middle Esophagus.

There were Manometric changes in the Lower Esophagus

Manometric changes in Lower Esophagus are:

There was a significant decrease in the amplitude of contraction and velocity of contraction in the lower Esophagus. A mean value of

77.82 reduced by 55.15 mmHg in 6 months following endotherapy p value <0.001

### **Esophageal motility changes after endoscopic intravariceal sclerotherapy with absolute alcohol**

U C Ghoshal et al. In this study there was a significant reduction in the amplitude of contraction of the lower Esophagus ( $63.4 \pm 24.9$  vs.  $18.2 \pm 14.3$  mmHg) and the duration of the peristaltic wave was prolonged in both middle and lower esophagus.<sup>(23)</sup>

### **Sequential Esophageal motility changes after Endoscopic injection sclerotherapy- by Granade et al<sup>(37)</sup>**

In this study there was a significant decrease in the amplitude of contraction of the lower Esophagus

While assessing the question of whether the mode of therapy intravariceal Sclerotherapy or Endoscopic Variceal Band Ligation affect the motility changes of the Esophagus there was a significant decrease in the amplitude of contraction and velocity of contraction in the EST group rather than Endoscopic Variceal Band Ligation group

This is compared to the study by **Geoff et al** which showed that there was no significant change in motility pattern of the esophagus following Endoscopic Variceal Band Ligation.<sup>(36)</sup>

### **Manometric changes following EST/EVL correlation with Number of sessions**

In this study there was a reduction in velocity of the middle esophagus when they underwent three sessions and both Endoscopic Variceal Band Ligation and endoscopic Sclerotherapy.

In the lower Esophagus in the EST group there was a significant change even after the first session

But in a group of patients who underwent both EST and EVL there was reduction in velocity of contraction following three times after therapy

Peeyush et al study shows that there the number of session correlated with the manometric abnormalities and not the amount of sclerosant injected.<sup>(25)</sup>

### **LES pressure :**

In this study there was no change in the LES pressure following endotherapy.

The LES pressure did not differ between the groups of Sclerotherapy and Endoscopic Variceal Band Ligation.

But however there was a fall in the LES pressure when the Number of sessions increased in both therapy group.

UC Ghosal et al have shown a reduction in the LES pressure following Endoscopic sclerotherapy<sup>(42)</sup>

Sauerbruch T, Wirsching et al did Esophageal functional scintigraphy which showed reduction in the LES pressure<sup>(22)</sup>(30.5 +/- 17.5 mm Hg versus 43.6 +/- 9.1 mm Hg, p less than 0.01)

Mario Costantini et al study did not show any reduction in LES pressure but it affected the LES relaxation pressure which impairs the bolus clearance causing retrosternal pain and dysphagia<sup>(28)</sup>

In this study there were no abnormal waves . there was no change in the length of the Esophagus and no abnormalities in the duration of the waves

## CONCLUSION

Endoscopic Sclerotherapy and Endoscopic Variceal Band Ligation causes Dysmotility

Dysmotility can occur a late complication due to persistent chronic inflammatory changes

High Resolution Manometry is a Novel method to identify focal segmental changes in motility following Endoscopic Sclerotherapy and Endoscopic Variceal Band Ligation

In this study there was manometric changes in the form of decreased amplitude and velocity of contraction in the Lower Esophagus

The motility changes were more commonly found in the Endoscopic sclerotherapy group.

Though in our study the two groups were not comparable in number

The number of sessions did not correlate with the Endoscopic Sclerotherapy group but in a group of patient who underwent both therapy they developed motility changes after third session

In this study there were no abnormal waves and Non peristaltic waves, no prolongation of duration of peristaltic waves .

None of these patients had any symptoms.

Endoscopic variceal sclerotherapy causes Esophageal motility changes six months after therapy.

There was no motility changes following Endoscopic Variceal Band Ligation alone was used.

These changes do not causes any dysmotility symptoms in patients.

## **PATIENT CONSENT FORM**

Study Details : A study of Esophageal Motility changes following Endoscopic Variceal Band Ligation or Sclerotherapy using High Resolution Manometry.

Study Centre : Department of Gastroenterology,  
Madras Medical college, Chennai.

*Patient may check (/) these boxes*

I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction.

☐

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected.

☐

I understand that sponsor of the clinical study, others working on the sponsor's behalf, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study.

☐

I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms.

☐

I hereby give permission to undergo complete clinical examination and diagnostic tests including hematological, biochemical, radiological tests.

☐

I hereby consent to participate in this study.

☐

Signature / thumb Impression

Patient Name and Address:

Place

Date

Signature of Investigator

Study Investigator's Name:

Place

Date



## INFORMATION SHEET

- We are conducting an Prospective “Study on Esophageal motility changes following Endoscopic Variceal Band Ligation or Sclerotherapy using High Resolution Manometry.” at Department of Gastroenterology, Madras Medical College and Government General Hospital, Chennai.
- The purpose of the study is to evaluate the Esophageal motility changes following Endoscopic Variceal Sclerotherapy / Endoscopic Variceal Band Ligation which is the standard of care for the management of Portal Hypertensive Upper GI Bleed. These motility changes will be studied using High Resolution Manometry six months following the therapy.
- Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.
- The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of investigator  
Date:

Signature of participant

# PROFORMA

Name :

Age :

Sex :

Occupation :

Address :

Contact No. :

Chief complaints:

**H/O Presenting illness:**

Onset:

Duration:

Amount of UGI Bleed

**Associated Symptoms**

1. Adb. Pain
2. Abd. Distension
3. Swelling of legs
4. H/O Jaundice.
5. Loss of Appetite
6. Difficulty in Swallowing
7. H/O hold-up, regurgitation
8. Urine Output
9. Bowel Habits

## **PAST HISTORY**

**Previous H/O UGI Bleed DM/HTN/TB/BA/IHD/CVA/EPILEPSY**

Post H/O Jaundice

H/o Sex , surgery/Jaundice/ Transfusion / Tatooing

H/o Umbilical sepsis / catheterisation

Treatment users

Nature of Treatment

Endoscopic Treatment

EST

EVL

Both

## **EXAMINATION**

Pallor/cyanosis/ Clubbing/ Pedal edema/ Raised/ JVP/ Icterus/

Lymphadenopathy.

Ht.

Wt.

BMI:

Oral Cavity

Abdomen Examination

Inspection:

Palpation:

Percussion:

Auscultation:

Per rectal Examination:

## **TREATMENT GIVEN**

EST

Agent:

Total CC:

IV/PV:

Conquest

No. of Sessions

EVL

No. of Bands applied

Complications if any:

## **INVESTIGATIONS**

CBC:

Hb:

TC:

DC:

ESR:

PLT:

Peripheral smear:

RFT: Urea

Creatinine:

Urine routine

Motion routine

CXR:

ECG:

USG ABDOMEN:

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Sl. No.	Name	Age	Sex	Dig	EST	EVL	No.S essio n	BASCLIN										STUDY GROUP									LES Pressure
								UE			ME			LE				UE			ME			LE			
								L	AMP	VEL	L	AMP	VEL	L	AMP	VEL	LES Pressure	L	AMP	VEL	L	AMP	VEL	L	AMP	VEL	
1	GANESH	35	M	NCPF	*		1	50.17	54.14	50.26	58.53	41.79	29.38	60.09	64.65	27.47	22.21	60.44	58.33	48.77	56.56	42.33	29.56	59.88	61.66	25.26	20.16
2	SUMITHRA	27	F	NCPF	*		1	63.09	45.16	31.23	77.43	60.05	30.61	61.23	89.01	31.12	28.43	44.37	41.12	23.57	63.73	36.17	43.19	44.37	31.23	27.52	28.13
3	VIGNESH	17	M	EHPO	*		1	50.93	37.92	50.26	67.65	61.64	25.22	49.41	70.45	26.57	19.13	51.92	36.99	37.23	66.12	60.65	25.01	50.23	66.34	24.12	22.19
4	CHINNAPONNU	56	F	CLD	*		2	54.73	46.37	32.94	66.79	79.58	33.57	45.61	85.58	37.2	24.45	40.4	73.91	19.84	57.34	46.3	33.49	67.96	73.48	32.57	29.23
5*	MALLIKA	45	F	CLD	*		1	50.93	50.22	33.41	66.89	58.43	38.9	63.09	74.45	27.39	27.1	59.03	58.22	34.13	68.96	54.83	38.9	53.21	42.15	19.12	27.1
6	LALITHA	33	F	EHPO	*		1	60.05	58.52	25.73	77.52	77.88	24.38	58.76	118.66	19.24	24.79	61.55	56.66	24.67	67.87	76.13	24.65	31.91	101.14	22.46	25.29
7	PRIYA	26	F	EHPVO	*	*	2	60.17	50.22	26.24	63.85	77.88	29.56	52.3	85.1	36.12	22.13	67.01	56.12	27.64	62.35	72.18	33.58	46.37	75.11	24.76	24.16
*8	TAMILARASI	28	F	NCPF	*		2	60.17	45.16	31.05	60.05	39.74	34.14	66.89	56.86	30.1	25.15	58.17	46.51	31.05	66.05	38.15	36.23	34.96	31.01	18.15	19.2
9	MANILA	28	F	NCPF		*	1	50.93	37.92	38.23	67.65	61.14	25.22	49.41	70.45	16.53	17.1	59.03	39.27	32.38	65.76	61.64	22.25	58.33	66.65	24.17	28
10*	VASANTHI	40	F	CLD	*		3	56.25	54.14	26.24	58.53	23.93	41.79	39.52	54.12	25.4	22.11	53.25	56.15	26.14	53.85	29.33	48.17	51.69	33.91	21.27	23
11	RAMAN	56	M	CLD	*		1	50.17	53.31	31.23	63.85	60.07	41.35	59.39	67.23	29.96	21	57.1	58.23	37.21	66.58	59.18	38.35	60.05	55.65	18.27	22
12*	TAMILMARI	35	F	CLD		*	1	60.05	60.68	40.26	60.05	21.71	36.46	47.89	80.95	25	24.12	66.56	62.38	47.16	48.79	78.59	25	34.96	51.12	30.34	31.23
13	MASTHAN BEE	40	F	CLD	*		1	61.02	58.52	58.81	41.05	55.75	32.6	45.15	92.03	36.15	29	62.01	68.52	56.18	48.5	60.75	35.8	31.92	86.1	36.12	28
14*	RAJANI	55	F	CLD	*		3	54.73	62.45	33.23	67.75	45.19	30.16	47.1	61.12	27.27	17.1	57.43	64.25	36.13	65.54	45.39	34.69	58.53	33.67	19.62	27.13
15	GUNA	26	F	CLD	*		1	63.09	45.16	31.23	77.43	60.04	30.61	61.23	89.01	31.12	18.23	69.03	48.26	36.23	83.45	72.15	38.61	48.61	62.12	22.21	28
16	PRIYADARSHINI	28	F	EHPO	*	*	2	60.17	50.22	26.74	63.85	77.88	29.56	52.3	85.1	36.12	19.18	67.1	50.22	27.64	66.58	78.78	31.56	46.37	75.11	24.76	25.33
17	KAMATCHI	35	F	NCPF	*	*	2	56.25	41.12	33.23	77.53	45.19	24.28	48.65	101.14	27.54	18	57.42	38.62	42.23	67.65	61.64	25.22	58.53	66.65	24.17	20
18*	PARVEEN	35	F	NCPF		*	1	64.27	53.31	31.05	77.53	79.58	28.3	48.19	73.23	29.19	23.23	67.42	51.33	29.05	76.35	73.58	23.42	31.16	37.53	19.19	23.45
19*	DHANALAKSHMI	43	F	CLD	*	*	3	70.69	41.12	25.73	73.73	32.16	40.99	56.22	65.19	33.27	15	76.16	47.32	28.37	71.48	38.38	49.09	44.37	31.23	27.52	19.12
20*	HASAN BASHA	19	M	EHPO		*	1	63.05	45.37	32.94	66.79	36.47	34.8	39.52	72.15	26.26	21	65.03	42.17	28.94	57.89	312.74	38.3	31.92	21.1	20.19	22.4

## **KEY WORDS**

1. EST – Endoscopic Sclerotherapy
2. EVL – Endoscopic Variceal Band Ligation
3. 6M – Six months
4. BL – Base line
5. CLD – Chronic Liver Disease
6. NCPF – Non Cirrhotic Portal Fibrosis
7. EHPVO – Extra Hepatic Portal Vein Obstruction.